



Daffodil International University

Department of Computer Science and Engineering

Faculty of Science & Information Technology

Midterm Examination, Spring 2023

Course Code:CSE 214, Course Title: Algorithm

Level: 2 Term: 1 Batch: 60

Time: 1.50 Hrs

Marks: 25

Answer ALL Questions

[The figures in the right margin indicate the full marks and corresponding course outcomes. All portions of each question must be answered sequentially.]

1.	a) Analyze the code time complexity and space complexity using mathematical formula <pre>int main() { int i,j,k; scanf("%d", &n); for (i =1; i<=n; i++){ printf("DIU"); } for (i=1; i<=1; i*=2){ printf("DIU"); } }</pre>	[3.5]	[CO1]						
	b) Write an algorithm to swap two given numbers without using a temporary variable. Analyze the complexity of the code.	[3.5]							
2.	a) Identify which algorithm listed under the best performing algorithm for sorting the following list. Construct every single steps. A[] = {7,8,9,10,11,12,13,14}	[3]	[CO2]						
	b) Suppose you want to search a number from the following array: <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>8</td><td>5</td><td>10</td><td>3</td><td>2</td><td>11</td> </tr> </table> Compare between Binary Search and Linear Search for the given array? Give appropriate explanation.	8	5	10	3	2	11	[4]	
8	5	10	3	2	11				
3.	Build the simulation for quick sort algorithm to sort the following list in descending order [10,14,19,26,27,31,33,35,42,44]	[4]	[CO3]						
4.	a) Suppose you have an unlimited supply of 1 taka, 5 taka and 10 taka notes. Apply your knowledge to find out a way to give someone 279 taka using minimum number of notes. b) Alibaba has entered inside the mysterious cave with a knapsack of capacity 5kg. He found the following valuables in the cave. However, he has found a way to break the items to carry in his knapsack. Apply your knowledge to determine the maximum value that Alibaba can take away in his knapsack.	[3] [4]	[CO4]						

Item Name	Diamond	Gold	Emerald	Ruby
Weight (Kg)	3	2	1	2
Price (in million BDT per kg)	8	3	7	6



Daffodil International University

Department of Computer Science and Engineering

Faculty of Science & Information Technology

Midterm Examination, Fall 2022

Course Code: CSE214 Course Title: Algorithm

Level: 2 Term: 1 Batch: 58, 59, Old Syllabus

Time: 1.5 Hrs

Marks: 25

Answer ALL Questions [The figures in the right margin indicate the full marks and corresponding course outcomes. All portions of each question must be answered sequentially.]

1.	a) Analyze the Big-Oh(O) complexity of the following two code snippets:	COI
i)	<pre>for(i = 1 ; i < n ; i++) { for(j = 1 ; j <= i ; j++) { printf("Algorithm is fun"); } printf("\n"); }</pre>	[2]
ii)	<pre>for(i = 1 ; i <= n ; i++) { for (j = 1 ; j <= n ; j++) for (k = 1 ; k <= j ; k++) printf("I am a genius!\n"); for(i = 1 ; i <= n ; i++) printf("I am again a genius!\n"); }</pre>	[2]
b)	Consider the following algorithm (on the next page) and the given array. Now run the algorithm on the array and demonstrate how the array will be updated at each iteration. Show every single step. A[5] = {4, 7, 2, 6, 8} and n=5	[3]

```

for i=0, i < n/2, i++ {
    for j=i, j <= i, j++ {
        k=A[i];
        A[i]=A[n-i-1];
        A[n-i-1] = k;
    }
}

```

2. Identify which searching algorithm you will be using in each of the following scenarios? Explain your choice (in no more than 3 lines per scenario) [6] CO2

- You have an array of 10 million floating point numbers sorted in descending order. You want to find a number from this array – let's call this operation a query. There is only a single query in this scenario.
- Now, you have the same array of same size but this time they are in ascending order. Again, there will only be a single query.
- For the third scenario, the numbers are unsorted. Again, there will be a single query only.
- For the fourth scenario, the numbers are unsorted and you have to make 1 million different queries.

3. Both merge sort and quick sort algorithms follow divide and conquer approach and their run time complexity in average case is $O(n \log n)$. Considering the following list, compare the performance of merge sort and quick sort algorithm for sorting the following list. [5] CO3

[7 6 5 4 3 2 1]

4. Suppose you have a file containing the following characters with the corresponding frequency. [7] CO4

A	B	C	D	E	F
45	13	12	16	9	5

If you encode the file with the following codewords identify the size of your file in terms of required bits?

A	B	C	D	E	F
0000	0001	0010	0011	0100	0101

Now it is possible to encode the file with fewer number of bits. Build the solution. Develop the solution step by step and finally construct the new code words for each character.



Daffodil International University
Department of Computer Science and Engineering
Faculty of Science & Information Technology
Midterm Exam Examination, Summer 2021 @ DIU Blended Learning Center
Course Code: CSE214 (Day), Course Title: Algorithm
Level: 2 Term: 2 Section:
Instructor: Modality: Open Book Exam
Date: Thursday 8 July, 2021 Time: 01:30pm-4:00pm
Two and half hours (2:30), Marks: 25

Question: 1 CO1: Analyze and calculate time complexity and space complexity of various algorithms or any written code using mathematical formula and comparison of algorithms. [Marks: 5]

- a) Suppose your ID is 193-15-12445, then **X will be $4 * 5 = 20$.** [2.5]

Count the number of primitive operations of each step. What is the **time complexity** of this segment and **justify** it?

```
#include<stdio.h>
int main(){
    int i, j, k;

    for(i = 1 ; i <= X; i++){
        for(j = 1 ; j <= X2 ; j++){
            printf("DIU CSE");
        }
    }

    for(k = 1; k <= X ; k++){
        printf("BLC");
    }
}
```

- b) Suppose, you are solving a problem through programming. Now, to solve that problem, you have two ideas of implementation. What are the **criteria** through which you can decide the best idea for solving the problem? Explain by giving an example. [2.5]

Question: 2 CO2: Generate and interpret the **output** of **iterative** and **recursive** codes with the analysis of the problem definition. [Marks: 5]

a) #include <stdio.h> [2.5]

```
void print(int ID, int count){  
    if(ID < 0 || count == 2) return;  
    printf("March Forward ID = %d\n",ID);  
    print(ID%3,++count);  
    printf("March Backward ID = %d\n",ID);  
}  
  
int main() {  
    int ID;  
    scanf("%d", &ID);  
    // Value of ID is the last two digits value of your ID  
    // For example if your ID is 191-15-1234 then ID = 34  
  
    for(int i = 0, j = 10; i < j; i*=3,j-=4) {  
        print(ID,0);  
        printf("ReCuRrEcUr\n");  
    }  
}
```

b) Write an algorithm that will find all the **Common divisors** and also the **greatest common divisor** of two integers A and B where A is the **last two digits** of your ID and B is the **reverse order** of last two digits of your ID. For example, if your ID is 111-15-1050 then A = 50 and B= 05. [2.5]

[N.B: C.D of 50 and 5 = 1, 5 and G.C.D of 50 and 5 = 5]

What will be the **time complexity** of your code?

Question: 3 **CO3:** Identify which algorithm listed under which algorithmic paradigm. **Compare** among various algorithms/implemented codes and choose the efficient one. **[Marks: 5]**

- a) Kajol recently lost her mobile phone and now she is in new market looking for a shop to buy a new phone. However, she does not know exactly where the shop is located and she feels shy to ask someone about it. She only knows the name of the shop. She is looking at the shop names and trying to find it out. Assuming there are n shops located one after another in the market. The shops are ordered by serial number not order by their names. Can you help Kajol to find out the shop she is looking for? Which method do you think would be more efficient for Kajol to find the shop? Explain. [3]
Do you think is there any way to optimize it by minimizing the overall searching time? If yes, explain how. If no, explain why?
- b) ABC University has more than 20k students and a large number of teachers and admins. Their database is not well organized and also they have space limitations. So which algorithm is appropriate for this University to sort their data and why? Explain it briefly. [2]

Question: 4 **CO4:** Break down and describe the **simulation** of various algorithms for different input values. **[Marks: 10]**

- a) Take **last 2 part** of your name and find the **variable code** length of the characters of your name using **Huffman coding** algorithm. Then show the comparison ratio between fixed length and variable length codeword. If your name exceeds 12 characters then take up to first 12 characters, not more than that.
[N.B: If last two part of Your name is “ANIK HASAN”, then you will have to find the variable length codewords for these characters.]
- b) Sorting is an integral part of Algorithm course. There are quite a few sorting algorithms such as bubble sort, quick sort, and merge sort. They are often quite interesting because of their different working methodologies and complexities. Now imagine you are asked to sort the digits of your own DIU student ID using **Merge sort** algorithm. Can you simulate the sorting process by mentioning necessary parameters in each step?
[N.B: Your id is 201-15-1234 then your array will be {2,0,1,1,5,1,2,3,4,} which you need to sort.]



Daffodil International University
Department of Computer Science and Engineering

Faculty of Science & Information Technology

Midterm Examination, Summer 2020 @ DIU Blended Learning Center

Course Code: CSE221 (Day), Course Title: Algorithm

Level: 3 Term: 2 Section: O-2

Instructor: Shayla Sharmin Modality: Open Book Exam

Date: Sunday 5 July, 2020 Time: 02:00-06:00pm

Four hours (4:00) to support online open/case study based assessment Marks: 25

Directions:

- Students need to go through the CASE STUDY shown in this exam paper.
- Analyze and answer specific section based on your own thinking and work.
- Do not share as this will be treated as plagiarism by Blended Learning Center.

1. How this algorithm Works. Describe it with a dataset. IF the procedure is wrong please modify it and correct it . 5

```
public static int recursive(int arr[], int low, int high, int key)
{
    int mid = low + (high - low)/2;
    if(arr[mid] == key)
    {
        return mid;
    }
    else if(arr[mid] < key)
    {
        return recursive(arr,mid+1,high,key);
    }
    else
    {
        return recursive(arr,low,mid-1,key);
    }
}
```

You are not a story writer. You are a programmer so answer specifically

2. Mention a data set and parsing through the fasting algorithm and write down full approach of algorithm 5

Which sorting algorithm will perform fastest to sort a list of numbers stored in an array for each of the following cases? [Note: You have to sort all the array in ascending order]

- i) You have an array, almost sorted in ascending order.
- ii) You have an array, almost sorted in descending order.
- iii) Your array is not sorted at all and your program will run on a micro-controller where there is very little memory available but you need to complete the sorting in fastest possible time.

3. Do you remember how you arrange your hand of cards in childhood? You first pick one card, then pick next card and put it after the first card if it is bigger or before the first card if it is smaller; then you pick another card and insert it into its proper position. Which algorithm is user to arrange your card? Please write down algorithm procedure and simulate through data set. 5

4. You are Carrying a Bag of 20 Kg .you went to the market and want to buy some food items suppose CHAL , DAL, ALU,TOMETO etc You have to fill up the bag with maximum profit. Describe it with calculation of your own. 5

5. You have to multiply two dimensional array. And print it to one dimensional array. Please calculate complexity of your code step by step. Decorate sudo code of your own input. 5

•

You are not a story writer. You are a programmer so answer specifically

Total Marks: 25

Time: 1.5

Answer all the questions precisely.

(The figure of the right margin indicates the full marks.)

1. Compute the time complexity of the following codes using **Big-O** notation:

a) `#include<stdio.h>`

```
main(){
    int i, j, k, n;
    scanf("%d", &n);
    for(i=1; i<=n; i++){
        for(j=1; j<=n/2; j++){
            printf("DIU");
        }
    }
    for(k=1; k<=n; k++){
        printf("CSE");
    }
}
```

b) `#include<stdio.h>`

```
main(){
    int i, n;
    scanf("%d", &n);
    for(i=1; i*i<=n; i++){
        printf("Algorithms");
    }
}
```

2. a) Write a **recursive function** to implement **Euclid's Greatest Common Divisor (GCD)**.

Algorithm.

- b) Write the **output** of the following recursive function call:

```
#include<stdio.h>
int fun(int n){
    if(n>=20) return n;
    else
        return n+fun(n+2);
}
main(){
    int c = fun(5);
    printf("C = %d", c);
}
```

- 3.
- a) "Linear Search and Binary Search are well known searching algorithms and both of the algorithms follows Divide and Conquer approach." - Do you think the statement is valid? Justify your answer in no more than 3 sentences.
 - b) Between Binary Search and Linear Search which one is better in terms of Time Complexity?
 - c) Suppose you are the system architect of a software development team and you need a particular problem to be solved. Zuckerberg and Steve are two software engineers working in your team and each of them has written a correct solution for the problem. Zuckerberg's solution runs in $O(N^3)$ while Steve's solution runs in $O(2^N)$ for a large input size N. Which of the two solutions you will be accepting? Explain your reason in no more than 3 sentences.
- 4.
- Consider the following array:
- arr[] = [3, 2, 1, 5, 4]**
- a) Sort the given array using **Selection Sort** algorithm. [Show the simulation]
 - b) Sort the given array using **Merge Sort** algorithm. [Show the simulation]
- 5.
- a) Suppose you have an unlimited supply of 1 taka, 5 taka and 10 taka notes. Please find a way to give someone 279 taka using the minimum number of notes.
 - b) Alibaba has entered inside the mysterious cave with a knapsack of capacity 5 Kg. He found the following valuables in the cave! However, he has not found any way to break the items.

Item Name	Diamond	Geld	Emerald	Ruby
Weight (kg)	3	2	1	2
Price (in million BDT per kg)	8	2	7	6

Now your task is to apply a suitable algorithm to help him choosing items to maximize profit. What will be his maximum profit? What are the items to be taken?

-----The End-----



Daffodil International University

Department of Computer Science and Engineering

Faculty of Science and Information Technology

Mid-term examination, Semester: Summer 2019

Course Code: CSE 221

Course Title: Algorithms

Total Marks: 25

Time: 1.5 hours

Answer all the questions

(The figure of the right margin indicates the full marks)

1. Compute the time complexity of the following codes using Big-O notation:

a) #include<stdio.h>

```
main(){
    int i, j, n;
    scanf("%d",&n);
    for(i=1;i<=n; i++){
        printf("DIU");
    }
    for(j=1;j<=n;j=j*2){
        printf("CSE");
    }
}
```

3

b) #include<stdio.h>

```
main(){
    int i, j, k, n;
    scanf("%d",&n);
    for(i=1;i<=200; i++){
        for(j=1;j<=n; j=j*2){
            for(k=1;k<=n; k++){
                printf("CSE")
            }
        }
    }
}
```

3

- c) Between 1(a) and 1(b) which program will run faster?

2. a)

- Write the output of the following recursive code:

```
#include<stdio.h>
void funct(int n){
    if(n<=0) return;
    n = n-1;
    funct(n);
    printf("%d \n", n);
}
main(){
    funct(5);
}
```

1

3

b) Suppose you want to search a number from the following array:

array = [8,5,10,3,2,11]

Between **Binary Search** and **Linear Search** which algorithm is appropriate for the given array? Give appropriate explanation.

2

c) Between **Merge Sort** and **Insertion Sort** which algorithm is better in terms of worst case time complexity? Justify your answer.

2

Consider the following Amount and set of Coins:

Amount = 12 Taka.

Coin = [2,5,7,10,20]

a) Apply **Coin Change** algorithm to given amount and set of coins using **Greedy** approach and find the required number of coins to change the amount.

4

b) Apply **Coin Change** algorithm to given amount and set of coins using **Dynamic Programming** approach and find the required number of coins to change the amount.

6

g) Compare the worst case time complexity of both of the approaches.

1



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Mid-term examination, Semester: Spring 2019

Course Code: CSE 221

Course Title: Algorithms

Total Marks: 25

Time: 1.5 hours

Answer all the questions

(The figure of the right margin indicates the full marks)

1. a) Compute the time complexity of the following code using Big-O notation: 5

```
main()
{
    int i, j, n;
    scanf("%d", &n);
    for(i=1; i<=n; i++)
        printf("DIU");
    }
    for(i=1; i<=n; i++)
        for(j=1; j<=n; j++)
            if(j == 5) break;
        printf("CSE");
    }
```

2. a) Write the output of the following recursive code: 3

```
main()
{
    funct(4);
}
void funct(int n)
{
    if(n<=0) return;
    funct(n-1);
    printf("%d", n);
}
```

- b) Demonstrate a scenario where Linear Search performs better than Binary Search. 2

If anyone wants to sort the following array in ascending order, between Insertion Sort and Quick Sort which one will give better performance in terms of time complexity? Give proper explanation 5

Array = [6, 5, 4, 3, 2, 1]

Apply the Greedy approach and Dynamic approach of Coin Change Algorithm (3+5+2) separately to the following set of coins and amount.

coin = [1, 5, 10, 20], amount = 14, minimum coin required = ?

Which one gives better performance in terms of time complexity and in terms of accuracy(minimum coin)?